A Tale of Two Fountains

by David T. Ford and Fatemeh Shirmohammadi

Fig. 1: Delbert J Haff Circle Fountain before renovation

Kansas Citians call their city the Paris of the Plains for reasons unknown to most of the world. The City of Kansas City, Missouri was planned much like Paris, with miles of boulevards and parkways connecting parks and green spaces. Kansas City's first fountains date back to the late 1800s and the community's love affair with fountains has flourished ever since. Today, you will find over 200 aquatic showpieces—large and small, artistically intricate and cleverly simple—gracing nearly every courtyard, parkland, and tree-lined boulevard throughout the area, including the Delbert J. Haff Circle Fountain and Meyer Circle Sea Horse Fountain.

DELBERT J. HAFF CIRCLE FOUNTAIN

In the 1890s, Delbert J. Haff rose as an essential figure for the city's Parks and Recreation Board, influencing the community's approach to preservation, beautification, and neighborhood-building, even today. In 1937, the city designed a circle entrance to the west side of Swope Park and at the east end of Meyer Boulevard, dedicating it to Mr. Haff and honoring his contributions to the local parks system (Fig. 1). Originally, the fountain pool measured 180 ft (55 m) long by 60 ft (18 m) wide, with depths that varied from 28 in (0.7 m) on the east end to 42 in (1.1 m) on the west end, and a low retaining wall of coursed stone.

Existing Condition

Aside from periodic maintenance, the fountain pool never underwent significant renovation or improvement over the years. By the 2010s, the concrete structure was crumbling with numerous cracks and spalls. The original concrete floor (Fig. 2 and 3) and walls (Fig. 4) showed numerous locations of concrete distress and the original filler in the concrete basin joints or wall-to-floor transition joints had not been replaced during its lengthy service life. Significant deterioration was observed at various locations within the perimeter architectural capstones. The original limestone masonry capstone on top of the basin walls was installed flat and the lack of slope had allowed rain and snow to collect on the stones, damaging the masonry substantially over time.

Most disturbing, the basin floor slab had settled and cracked. This considerable structural distress, however, was not the Kansas City Parks & Recreation Department's (KC Parks) motivation for repair. Their primary concern was that the fountain did not actually work and had been increasingly plagued with active leaks, creating unnecessary operational expenses. Ultimately, KC Parks sought to completely repair the leaks, but more importantly, to modernize the fountain pool and ease the burden of future maintenance by decreasing its volume capacity.

Condition Assessment

First, the source of water leaks was identified: cracks, joints, piping connections, or all three. To do that, the fountain's manual fill line was shut off and the water depth was periodically measured and recorded to determine if the basin itself, or valves in the water service line, were leaking. Over two consecutive days, the basin water depth was measured at approximately 8:30 a.m. and 5 p.m., noting no water at the fill line outlet after the fill line valves were closed. Downstream gate valves in the meter vault appeared to be completely seal closed. Deducting the average regional standard for water evaporation from the gross volume water loss, a significant water loss of 7,500 gallons (28,390 liters) per day was recorded.

Next, three concrete cores were extracted from the fountain's basin. While the compressive strength and chloride content of the cores were favorable, the quality of the internal microstructure—internal cracking caused due to past freeze-thaw—had and would continue to damage the concrete.

Fig. 2: Concrete spalling at fountain slab

Fig. 3: Close-up of concrete spalling at fountain slab

Fig. 4: Concrete deterioration at original concrete walls

Fig. 5: Construction of new slab-on-grade

The assessment revealed that the bulk of water was lost due to failed filler within large control joints/gaps within the slab, but extensive deterioration of the concrete in various locations also increased its permeability, thus creating additional sources/paths for water to escape the fountain.

Repairs

Considering the condition of the basin slab and walls, the original slab-on-grade needed to be removed while the concrete walls of the fountain could be salvaged. A 6 in (150 mm) thick, heavily reinforced concrete slab-on-grade was designed with water stops and expansion/control joints to limit cracking (Fig. 5). To further ensure water-tightness, a two-coat, cementitious waterproofing system was applied to the new basin slab and original fountain walls, which were sounded and partially repaired as needed. The new, cementitious waterproofing system also created a protective layer to expand the service life of the concrete slab. To finish, the design added a new dolomite capstone with a sloped surface on top of the

Fig. 6: Delbert J. Haff Circle Fountain after renovation

original walls. In the end, the fountain's volume was cut in half—from 223,000 gallons (844,150 liters) to 111,500 gallons (422,075 liters)—and created a more sustainable water feature that retains all of its original beauty (Fig. 6).

In addition, a new subgrade concrete vault was designed to replace the existing, deteriorated vault, housing the fountain's new mechanical and electrical equipment. To avoid any future concrete deterioration or water infiltration and expand the service-life of the concrete vault, a permanent, subgrade dewatering system with pump stations was installed to drain the ground water around the vault.

MEYER CIRCLE SEA HORSE FOUNTAIN

The Meyer Circle Sea Horse Fountain is one of Kansas City's most popular and most visible water features. Located in the traffic circle at Ward Parkway and Meyer Boulevard, nearly 40,000 vehicles pass by the fountain every day. The fountain itself—measuring 100 ft (30 m) in diameter with a depth of 30 in (0.8 m)—was originally constructed in 1925 and has since evolved into an iconic Kansas City landmark. The ornamental sculpture resting on top of the masonry pedestal traces its roots to 17th Century Italy (Fig. 7). It was purchased by J. C. Nichols in Venice in the early 1920s and gives the fountain its whimsical name, with the three mythological sea horses perched atop the stone pyramid.

Existing Condition

The fountain had gone through three major renovations/improvements during its service life. In 1960, a 4 in (100 mm) thick, concrete topping slab was installed on top of the original basin floor. In 1966, the jets and portions of the statue that had been stolen or vandalized were replaced. And in 1992, a new fiberglass pump vault was installed at the south side of the fountain. Somewhere along the way, KC Parks upgraded lighting features in and around the fountain and increased the height of its retaining walls, but subsequently lowered them again after public backlash. Most recently, the water feature had experienced increasingly disruptive malfunctions that led to a lengthy operational shutdown in 2015. These disruptions stemmed from excessive flooding within the underground mechanical and electrical vault located on the south side. Additionally, excessive leaking required KC Parks to install water inlets to maintain operability by continuously supplying water.

Compared to the Haff Fountain, the concrete structure of the Meyer Fountain was in much better shape. The Meyer Fountain was originally constructed using concrete slab and walls and finished with limestone masonry for the exterior veneer, matching the center masonry pedestal supporting the sculpture. The concrete floor was in fair condition, with localized spalls and freeze-thaw damage at the east side of the basin. KC Parks' restoration plan for the Meyer Fountain aimed to repair all leaks and waterproof the mechanical vault, while maintaining the feature's original materials and aesthetics.

Fig. 7: Sculpture at center of Meyer Circle Sea Horse Fountain

Fig. 8: Gap between basin floor and perimeter wall

Condition Assessment

To identify the source of water leakage in the vault, members of KC Parks' facility maintenance management team were interviewed. They indicated that the vault didn't flood when the fountain was empty, and thus, partially attributed the source of leaking to deficiencies below the central pedestal. After water-spray testing the pedestal and other locations of the basin, the source of the leak was identified at the joint between the basin floor and the perimeter walls on the south side (Fig. 8). To remedy this issue, sealing the joint and adding a cementitious waterproofing system on the top was recommended.

Three concrete cores were extracted from the area of most concrete spalling on the east side of the fountain floor. Significant freeze-thaw damage and ettringite—an expansive, secondary deposit—were reported. Ettringite can lead to internal cracking and diminish the concrete's durability by increasing freeze-thaw susceptibility. It was concluded that the concrete deterioration likely resulted from water infiltrating the microstructure.

Fig. 9: Creating slope at top of perimeter wall using concrete overlay

Fig. 10: Installing new underground concrete vault

Fig. 11: Meyer Circle Sea Horse Fountain after renovation

Fig. 12: Meyer Circle Sea Horse Fountain in operation after renovation

Repairs

The 4 in (100 mm) thick concrete slab topping was partially removed along the east side of the floor and replaced with a new concrete infill.

To finish, the existing capstones on top of the basin walls were installed flat. Because the existing capstone was in fair condition—unlike that of the Haff Fountain—the adjustment could be done on top of the wall. The existing capstones were removed and re-installed after creating a slope on top of the wall using a concrete overlay (Fig. 9). To support maintenance efforts, a new subgrade concrete vault was designed to house upgraded mechanical and electrical equipment, replacing the existing fiberglass vault (Fig. 10). Views of the fountain after renovation are shown in Figures 11 and 12.

SUMMARY

Weather and water are harsh elements for any material to withstand over time. For both the Haff and Meyer Fountains, the structural concrete of each feature began to show signs of that struggle, leaking water and eventually losing function. KC Parks, understanding the importance of these two landmarks, stepped in to facilitate their restoration before the damage was too great to correct.

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